MEDIATEC SHOP

Rauland

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TC4 DIAGNOSTIC PROGRAM

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SPEED KEYS:

Listing of Special Keys and their Function(s).

NOTE: *Ctrl-B, Ctrl-X,* etc. means press the Key labelled Ctrl and the designated letter Key ar rhe same time.

In Terminal Mode

Press Key(s): To:

Ctrl-A	*Go to Architechural Programming Screen*
Ctrl-B	*Go to the Baud Rate Menu (Opening screen)*
Ctrl- c	*To Exit program*
Ctrl-D	Diagnostics
Ctrl-F	Phone List Menu
Ctrl-P	Toggle Printer on/off
Ctrl- T	Type Text File
Ctrl-X	Send Hex File
+ + + ATOH plus number	to call another modem
ATHO	Hang Up mmodem

In Architectural Programming Mode

Press Key(s): To:

F1	Location Codes/Edit Architectural Data
F2	Help
F3	Cancel (Location Code Editing Only)
F3	Block Program (Architectural Data Only)
F4	Block Status
F5	Copy Previous Attributes/Copy Previous Code
F6	Load from Disk
F7	Save to Disk
F8	Capture Data from TCIV
F9	Send Data to TCIV
FlO	Print

A Quick Tour of the TCIV Diagnostics Program

1 Review the "Checklist" on page 7.

2. Start the T6 Diagnostics program by Typing T6 and pressing *Enter* or by rebooting (pressing Alt-&l-Del) system.

> Note: If you are calling a modem and know the baud rate/COMM port selection number, you can go directly to the TERMINA MODE by Typing T6 plus the selection number.

> EXAMPLES: T6 2   starts T6 in the Terminal Mode set for 1200 baud on COMM port 2

> T6 7   starts T6 program in the NO CPU CONNECTED Mode

3. At the Opening (Baud Rate) Menu select a baud rate/COMM port combination or "NO CPU CONNECTED".

4. If you selected "NO CPU CONNECTED", skip to step 7, otherwise
   a) The screen will display "TERMINAL MODE" just below then Baud Rate Menu.
   b) If you have prepared a Phone Directory (See preparing a Phone Directory), press *Ctrl-F* to display it and select the desired number.
   b) Otherwise, place a Manual call by Typing ATDT (all caps) plus the phone number of the modem you are calling. EXAMPLE: ATDT3122671300
   c) when you hear the carrier tone, go to step 5.

5. Press a *Ctrl-Key* combination as follows:
   a) For Architectural Programming go to Step 6.
   a) To change baud rate/COMM port go to Step 9.
   c) To Exit press Ctrl-C.
   d) For Diagnostic Functions go to Step 11.

6. Press *Ctrl-A* to go to Architectural Programming Screen.

7. Select a desired Function by pressing a Function Key from list in the Prompt Box at the top of the screen or begin   Architec tural Programming by using the Arrow keys to move the cursor to the field to be edited. See Chapter 3, Architectural Program- ming for more detail.

8. When finished with the Architectural Programming feature, press *Esc.*

9. Press *Ctrl-B* to go to baud rate/COMM port menu screen.

10. Go to Step 3

11. Press *Ctrl-D* to go to Diagnostic Options Menu Screen.

12. Select the desired function from the menu. See Chapter Diagnostics for more detail.

CAUTION: The T6 program does Not contain Error Traps. If you attempt an invalid operation or combination of operations, the program will "Lock Up". If this happens, Press Ctrl-C to exit the program and start over. If Ctrl-C doesn't work, Reboot (press Alt-Ctrl-Del) your PC.

Chapter 1
INTERFACE

General considerations on modems, serial communication, & RS232 as related to TC4:

1. MODEMs: You need either two Bell 212A or two Bell 103 type modems. The 212Ais **preferable** since it offers two speeds(300/1200b). The 1200 baud is four times as fast and therefore more convenient. The modem at the TC4 should be auto-answer so that the entire communication process can be controlled from your PC. There are a variety of phone line arrangements that will work. A dedicated line is best, but it also costs the most.

Modems whether internal (Inside of the P.C.) or external often require some of these handshake signals before they will begin to communicate. To use a modem with the TC4 these handshake functions must be turned off by:

> - Jumpers on the DB25 connector (RS232)
> - DIP switches on the modem
> - Jumpers inside the modem

If the modem manual does not describe how to get the modem to work without any handshaking lines, it may be necessary to call the modem manufacturer for technical support on how to do this. Most modems can be made to work as required by the TC4, with just pins 2,3,7 of the RS232 25 pin connector (DB25).

Certain "line- powered" modems cannot be enabled by jumpers from their own DB25 connector; these types should be avoided. Also see note 3. below.

2. Make some adapter cables as follows. The RS232 standard uses the "DB25" type 25 pin connectors. A drawing of this cable is given in the TC4 manual. Connections are:

DB25 Pin	function
2	The data input of a modem or the data output of a PC.(the input must be connected to the output to get communication ("mouth-to-mouth and ear-to-ear communication won't work.) Connect the input to one end of the four pin receptacle & label it "in."
3	The data output of a modem, or the data input of a PC. Connect the output to one end of the four pin receptacle and mark it "out."
7	Ground. Connect to two center pins.
4, 5, 6, 8, 2 0	These are handshaking lines. They are used as a means of controlling the flow of serial data between devices. Logic signals on these terminals can be used to start & stop the flow of data between serial devices. The TC4 does not use or offer any of these signals. It accomplishes flow control through the data lines by sending ASCII codes based upon a protocol known as "XON, XOFF" so any serial printer used with TC4 must be capable of working with this protocol. See equipment manuals on how to disable handshaking lines, They are not included in TC4 serial cables.

3. Voltage. The RS232 standard calls for -5 & + 5v to indicate **1** & 0 respectively typically -12v & + 12v are used. Although the TC4 does not supply any negative voltage, but the Ov & + 5v available from the CPU serial connections has been found adequate for most modems and computers.

4. Connecting any two serial devices equipped with four pin adapter cables as described above, is done by taking a four pin male assembly and using it between the two receptacles. Just be sure that you mate the pins marked "in" with the pins marked "out". The advantages of this method are:

4.1. You don't have to worry about the genders (e.g., you wont find yourself trying to plug a male into a male).

4.2. You don't have to worry about the device type eg. PC or modem

4.3. You don't have to worry about handshaking compatibility.

4.4. You can reach the pins for test purposes. In the case of a PC, you can just connect the output right back to the input to test the operation. If your system is working in full-duplex (as with the TC4 diagnostics) each key that you press will send an ASCII code out the output. It will then follow the connection over to the input where it will be received and displayed on the screen. This test will work even if you don't know the baud rate, because the input & output baud rates are the same.

5. Cable requirements for direct or thru modem communication to a TC4 are:
   – One cable for each modem (See drawing KM-0873).
   – One cable similar to the above for your PC. This can go to a modem, or to the TC4 CPU.
   – You need the modular cable that normally comes with the modem to connect to the phone line.

NOTE: If you have an internal modem in your PC, and you do not intend to do any direct connections to a TC4, **you** won't need the PC cable or the second modem cable.

Chapter 2
CHECKLIST

Each time that you use your diagnostic program, you should review the following checklist to make sure that things go as smoothly as possible:

1. The baud rate jumper on the TC4 CPU must be set to 1200 or 300, whichever you are using.

2. The EEPROM write-enable jumper on the TC4 CPU must be set to ENABLE if **you** want to make programming changes, or use diagnostic functions. If you just want to look a setup data then you can leave the EEPROMs disabled.

3. Test the modem operation by calling it from another phone. It should answer and give you a tone that lasts for about 30 seconds.

4. You need to know which serial port of your PC you are plugged into, "COMl" or "COM2", and your desired baud rate. When you start up the program by typing "t6" you will get the following prompt:

    1. 1200 baud, port COMMl:

    2. 1200 baud, port COMM2:

    3. 300 baud, port COMMl:

    4. 300 baud, port COMM2:

    5. 2400 baud, port COMMl:

    6. 2400 baud, port COMM2:

    7. NO CPU CONNECTED

Just press the appropriate digit to make a selection. The other communication parameters are automatically set as required for the TC4 CPU (8bits, no parity, one stop bit). Choosing option 7 causes the program to not to ask the CPU for data when editing the architectural information. This allows you to edit a data file from disk and save those changes without actually being connected to a CPU.

If you make a mistake choosing the communication set up you may change it by typing ^ B and selecting the correct set up from the menu.

You may bypass the communication set up menu by typing number corresponding to the menu entry on the command line. For example typing "t 6 2 " at the DOS prompt will execute the diagnostic program with communication set at 1200 baud, COMM2:

5. Refer to your modem manual on how to perform dialing and establish communication.

Chapter 3
COMMUNICATION

1. TERM MODE

initially you will have simple communication with the TC4 monitor program. When you type a character, it is echoed by the TC4, received by your serial port, and displayed on your screen. Type a few spaces to verify proper communication connections & setups (baud rates, cables etc.). Each space will be echoed, and additionally, the TC4 will send two hex characters (O-9 & A-F) representing the contents of some memory location. A menu of monitor commands can be obtained by typing '?'. These monitor commands are used by the higher level communication program functions. You can:

    get memory
    set memory (if the EEPROM jumper is enabled)
    get input port value
    set output port value
    Halt the system (if monitor lock location = 0)
    do block transfers.
    call TC4 functions (' ^ G') with up to one parameter (eg: Typing "0 = ^ G" will reset the TC4. Note: ^ G means hold down "Ctrl key" while hitting the 'G' key. ^ G is one of the 128 standard ascii codes. Prior to version 14 software the ascii "G" was used instead of the " ^ G" for this function..
    all commands & data are in hex (upper case req'd)

2. DIALING MENU (^ F):

Auto Dialing by Menu: **Auto** dialing modems respond to commands such as "ATDT913122671300" where the command breakdown is "AT" means 'Attention modem!"; "D" means "Dial"; "T" means USC "Tone dialing". The digits to dial in the example above are then "9-1-312-267-1300". Dashes are omitted since they are not relevant. Dialing can be made automatic by preparing a specially formatted ascii tile with your editor such as the following:

    /Return modem to command mode/ + + +/
    /Hang up line/ATHO
    /Rauland · Borg Corp.   /ATDT13122671300
    /Pentagon   /ATDT12132221234
    /Lincoln School   /ATDT2322233

Explanation of tile: Name is "PHONE.DIR". The first line is the first phone number on the menu. The first character on a line becomes the delimiter character & when encountered next on the line, marks the end of description, and the beginning of the characters to be sent to the modem. The third "/" (delimiter) is optional and on the first line in the example above tells the program not to send a carriage return character after the command.

If this file is present on the disk when running the T4 program, the menu may be obtained by typing ^ F (as in Fone(phone)). A menu will be produced consisting of the messages in the tile, along with a key for each message. Pressing a key will send the associated modem command (second part of each line in the "PHONE.DIR" file). If a fourth "/"(delimiter) is in a line of the tile it will cause the modem menu to remain on the screen after sending the command. This allows a command to be repeated, or a series of commands to be sent. While in the menu mode, characters received back from the TC4 are also displayed. Thus menu items can be designed to send special monitor commands to the TC4.

3. ARCHITECTURAL PROGRAMMING.

Type ^ A (" ^ A" means hold down "ctrl" key & then press "A"). The screen will display two boxes. The top box contains a menu of the commands that may be issued by pressing a function key. This box will be referred to throughout the rest of the manual as the PROMPT BOX. The larger box located below the PROMPT BOX is called the DATA BOX.

The PROMPT BOX.

The Prompt Box is used by the program to communicate with you. It prompts you for information and reminds you of your options while editing.

The DATA BOX.

The Data Box contains the information to be edited. There are hvo types of data displayed; Architectural Programming and Location Codes.

Architectural Programming is of the form:

P:xxx   N:xxx   A:xxxxxxxx B:xxxxxxxx Z:xxxxxxxx

where:

- P: is the physical number of the line.
- N: is the architectural number assigned to the line.
- A: is the A-attribute of the line.
- B: is the B-attribute of the line.
- Z: is the Z-attribute of the line.

Location codes are of the form:

LOCATION   CONTENTS

where:

- LOCATION is the location code number.
- CONTENTS is the number stored at the location code.

----

note: All functions that send data to the serial port should be turned off before using the active list dump otherwise, the data blocks may have to be sent many times before they will be received correctly. Examples of the type of functions meant are Page Logging and DTMF Logging.

FUNCTION KEYS.

The initial display of the Prompt Box is of the Function Key commands. The function keys are usually across the top or to one side of your keyboard and are labeled "Fl" - "FlO". Pressing a function key causes the associated action to take place.

Fl - LOCATION CODES / EDIT ARCH DATA.

Pressing function key 1 will switch the data to be edited in the data box from Architectural Data to Location Codes vice-versa.

F2 - HELP

Pressing this key causes help to be sent.

-When editing Architectural data the screen is switched to display a table of the line types and the meanings of the associated B-attributes. The table is stored in the tile "arch.hlp". Pressing F2 again returns you to the editing screen.

- When editing the Location codes pressing F2 causes the display of each location code on the screen to be labeled from the file "loc.hlp". As you scroll the code the help info will move off the screen, but can be restored by simply pressing F2 again.

F3 - BLOCK PROGRAM   (architectural data only)

This function key will copy the architectural information of the highlighted line to a range of lines. The prompt box will ask for the range of lines to be included. You may Enter a range of the form: from-number "-" to-number or just "-" to-number. You will then be asked which fields you want altered (n,a,b,z). Typing these letters will cause them to turn on and off. Only those fields displayed will be altered. A, B, and Z attributes will be duplicated within the specified range. The architectural numbers

will be set to one plus the previous number. For example if current architectural number is 105 the resulting block will be numbered 105, 106, 107, . . .

F3 - CANCEL   (location code editing only)

This function key will cancel the current calculation being performed in the contents field, and restore its previous value.

F4 - BLOCK STATUS

This function displays the status of the blocks stored in memory of the computer. A block is a segment of data that is easy to transmit. The blocks received from the CPU are altered in memory and then must be transmitted back to CPU for the changes to become effective. As blocks are received or sent to the TC4 the statuses must be updated. There are 32 blocks of memory in the TC4 and the status of each block is shown in the following manner.

> ' + ' - valid block same data as in TC4
> '-' - invalid not accessed yet
> '*' - modified in pc memory but not in TC4 memory

To facilitate the programming of systems with dual eeproms you may choose the modify option of the block status function. This will change the status of all valid blocks to modified in order to allow them to be transmitted by choosing F9 at the main menu. A sample session to copy the entire eeprom programming of the first bank into the second would be:

> F8 - to load eeprom programming into memory.
> F4 - to display block status.
> M - to change the valid blocks status to modified. Switch the cpu to the second eeprom bank.
> F9 - to send the eeprom programming back to the second bank.

F5 - COPY PREV ATRIBS / COPY PREV CODE

Copy the previous line's data fields to the line highlighted by the reverse video bar and move the highlight bar to the next line. This is useful in programming small groups of lines that are to have the same data by repeatedly pressing the F5 key.

F6 - LOAD FROM DISK

Load data tile from disk. The prompt box will ask you for a tile name to load you may enter a file name or a ' + ' to view a directory. (see note below)

F7 - SAVE TO DISK

Save data file on disk. The prompt box will ask you for a file name to save. You may enter a file name or a ' + ' to view a directory. If you view the directory then you will be asked again for the file name.

> note: In order to perform directory function a copy of command.com file must be in the root directory of the current drive. "*" & "?" may be used to view a subset of file names in a manner similar to that used with the DOS "DIR" command.

Files saved to disk may have a header of descriptive information included. This header can be displayed while not running the diagnostic program by entering the command "type filename.dat" at the dos prompt. The actual programming information may only be viewed by using the diagnostic program.

F8 - CAPTURE DATA FROM TC4

This command will cause the diagnostic program to acquire all 32 blocks from the TC4. Hit ESCAPE key at any time to cancel. All data blocks will be "valid" after a capture is performed.

F9 - SEND DATA TO TC4

This command will cause the diagnostic program to send all 32 blocks to the TC4. Blocks marked "valid" (same as TC4) will be skipped to save time. You may hit the ESCAPE key at any time during the transfer to stop it. All modified data blocks will be valid after a send is performed.

Fl0- PRINT

This function allows you to print a range of attributes or location codes to the printer or a file. The prompt box will first ask you for the range. You may enter from-number "-" to-number or "-" to-number to print from the current highlighted entry. The

● Chapter 4
DIAGNOSTICS

Type ^ D for *menu:*

      1. DUMP ACTIVE LIST
      2. DTMF TEST
      3. READ STATISTICS
      4. I/O DIAGNOSTIC
      5. LOGGING
      6. EXIT

1. ACTIVE LIST DUMP-

This function can be used to take a snapshot of activity of lines in the TC4 at a given instant. The process begins by loading a small program into a reserved area of nonvolatile memory in the TC4 CPU. The program is called "TDG07.HEX" or "TDG08.HEX" and these files must be present on the disk with the 'T4' program. At start up, an empty list is shown along with the reverse video menu line at the top of the screen. This menu shows the choices available within this process:

G - Get new active list data. TC4 is halted for a few milliseconds while data is transferred to a save area. Then the saved data is sent to the PC while the TC4 continues to run. This is a major improvement over the previous versions which halted the TC4 during the entire process causing serious interference with a busy TC4.

note: All functions that send data to the serial port should be turned off before using the active list dump otherwise, the data blocks may have to be sent many times before they will be received correctly. Examples of the type of functions meant are Page Logging and DTMF Logging.

R - Resend the data previously stored in the TC4 save area. This can be useful after leaving the diagnostic program for some reason. If a prior Al dump is still in tact in the TC4 save area (TC4 has not had power down or reset) it can be recalled using this option.

S - Save the present active list in an ascii tile to be printed or studied at some later time.

[Esc] - Press this to exit from the AL Dump program. If the AL Dump diagnostic is restarted later during this 'T4" program session, The same data will be shown again until another "G" or get cycle is performed.

[scroll up, down] - The up down arrows can be used to move a reverse video bar up and down on the screen to highlight selected records, or to scroll additional records onto the screen. This is a substantial improvement over prior versions which just allowed one pass through the list, and kept the TC4 halted until the end of the list was reached. The active list records are numbered 1 to 64 as required. The record being highlighted is stated in the upper right corner of the screen at all times.

Note: Every line in the TC4 has a physical number. Every line that is active must have an active list record to specify which procedure is controlling it, and to maintain certain relevant data about the current activity. In the case of call-ins, the activity refers only to the time while the call-in terminal is grounded, and not while the call-in is maintained in memory.

Attributes - The "A & B" attributes and the architectural number associated with each active line, are shown on the right half of the line if available in local PC memory. Prior versions did not show this important information in the active list dump. If the information is not available, then just dots are shown. The missing information can easily be added by leaving the AL Dump function & diagnostics temporarily, and going to the Architectural functions (^ A). The data can be obtained from disk if available, or from the TC4 by listing, or capturing options in the Architectural menu.

    SU: 9 OB: 5 p:0000 PR:CALLIN   **LI:255 N:I05   A: 1   7**   **B:I23**

    S U : I O I   OB:127 p:0010 PR:SVPHONE L I: 8 N:201 A : 1   **B:I**

    SU:127   0B:101   p:OOI2   PR:RING   **LI: 8 N:227 A: 1**   **B:I2**

SU: SUbject physical number. This record is about this PHYS number. Records are ordered by this number.

OB: OBject physical number. Can give the physical number of an associated line. Sometimes may be used to store other information when OB: data is not available. (Call-ins don't have Object phys nos).

p: Parameter field not generally relevant in trouble shooting situations but contains data used by the control program.

PR: PRoc or procedure name. This program will show descriptive names for most functions, but some may just have **numbers**. All supervisory functions begin with SV:

prompt box will then display the range to be covered in the upper right comer and ask you if you want to print to a file, the printer or quit. If you select a file then the prompt box will ask for a file name.

ARCHITECTURAL EDITING

Use the right & left arrow keys to select & highlight a field for editing:

- P field: entering a number in this field causes the editor to jump to that physical number's position in the data. It does NOT alter the physical number of the current line.

- N field: entering a number in this field will change the architectural number of this line.

- A,B,Z fields: moving onto one of these fields and typing a number 1-8 will toggle that number on and off.

LOCATION CODE EDITING

- LOCATION: moving onto the location and typing a number causes the editor to jump to that location code entry.

- CONTENTS: moving onto the contents field of a location and entering a number changes the contents to the value entered.

calculator function: When in the contents field you may use the '+' and the '-' for addition and subtraction of the contents to the value entered next. You may multiply the value entered next by another number by using the '*' key. This is useful for evaluating formulas as follows:

[first line in group] + 256 • [number of lines - 1]

If there were 10 lines in the group staring at 5 the key strokes would be:

5 + 256*9return

yielding the result 2309.

SVPHONE - Admin phone or multi link staff phone in use.

SVINTER - Outside line in use, AAI, DIL type.

SVDIA - Outside line in use, DIA type.

SVSPEAK - Speaker in use for communication.

SVSTAFF - Single link staff phone in use.

These are used once a communication path has been established while waiting for **a disconnect. Some other** PROCs: PARSEO, PARSEl receiving DTMF tones, ABAND admin phone abandoned by the receivers for exceeding time limit. The number 255 is used as a temporary PROC for active records being deleted from the list.   You can easily experiment to find others.

LI: The number of the link in use if any, else 255.

The example records show the following:

1st record - The location with PHYS number 9 is calling in. There is an admin phone but this record beii CALLIN proc is probably the result of a ground on the "T" terminal. No link is in use by this line.

2nd record - PHYS line 101 is using link 8 **for communication and is in its supervisory state (finished dialing). The object line is** 127.

3rd record - PHYS line 127 is ringing in link 8 & is associated with line 101.

TC4 can hold a maximum of 64 active records. This would be four lines per link. After that, service is refused..

2. DTMF CHECK-

Connects the two DTMF receiver-registers together in a link. Uses one to send a series of tones to the other. An admin phone can optionally be included. Enter a string such as "1234567890#*. ". The period at the end is needed to turn off the trailing tone "*". Then type "S1" or "S2" to say   which receiver you want to do the sending. The succession of tones will then be sent. Then type "R" to receive and both receivers data will be obtained and displayed on your screen & should match the string sent. You can also use the phone to send or monitor the tones. This test can be performed remotely, but the system is halted for the duration of the test since both   receivers are being tied up. When halted, calls in progress are not dumped, but new **calls of any kind are prevented**

3. STATISTICS-

Gives you a list of statistics concerning activity in your TC4. These numbers are maintained in the TC4 CPU RAM. They are not affected by manual or watchdog resets, but are lost when power is shut off. They normally contain "garbage" at power up. Here is a typical display when you select this function:

```
  1  RESETS
255 SERVICE REQUESTS
104 ADT'S GOT DIAL TONE
 10   DIA'S GOT DIAL TONE
 45 INCOMING CALLS
 9 6  CALLINS
 95 OUTGOING CALLS
  8 WAS LINK MAX
 19 WAS A.L. MAX
  3 DTMF FAULTS
    RESET STATISTICS(Y/N)?
```

This display shows:

1. That there was one reset since the statistics were reset. Watchdog, & front panel resets count the same.

2. There were 255 service requests. (pressing a call-in button, picking up a phone to make a call, **incoming interconnect.**

3. 104 Admin phones got dial tone.

4. 10 DIA interconnects got dial tone.

1. That there was one reset since the statistics were reset. Watchdog, & front panel resets count the same.

2. There were 255 service requests. (pressing a call-in button, picking up a phone to make a call, incoming interconnect.

3. 104 Admin phones got dial tone.

4. **10** DIA interconnects got dial tone.

5. There were 45 incoming (non DIA) calls.

6. There were 96 call-ins from staff stations.

7. There were 95 outgoing calls.

8. The maximum number of links in use at any time was 8. This gives an indication of 50% usage of TC4s peak traffic capability of 16 simultaneous links.

9. 19 was the maximum number of active lines. TC4 can handle up to 64 active lines or PHYS numbers.

10. DTMF FAULTS shows 3. These are occurrences where an admin phone goes off hook but cannot get dial tone because both receivers are busy. A fault is counted only if the admin phone then hangs up without waiting for dial tone.

If you answer yes to the question "RESET STATISTICS?", all will be set to zero and the counts will go from there. Note down the date & time of reset & take later readings to see how much traffic is going thru your system & when.

4. I/O DIAGNOSTIC-

The system is halted when this diagnostic is used. Its allows static operation of LLM & SC25 flat cable busses. Logic signals on these flat cables which normally only last for microseconds, are held static and can be measured with a voltmeter. The bottom line of the screen shows the physical number line and link selected as well as the status of any phones or call-in switches. The bottom line is updated constantly, while other lines record previous measurements. The status of the misc input port (3) of the MI0 is also monitored. You will receive a menu which is actually a rough graphic layout of the keyboard & functions:

```
   --LINK--                                           --PHYS--
   |A|  |S|                                           |K|  |L|
          --LLM--     --SC25--   --SCC25--  -MENU-       --NEXT--
          |Z|  |X|   |C|  |V|   |B|  |N|     |M|         |,|  |.|
```

|Z| |X| **=** disconnect/connect(& Ring if on hook) LLM line

|C| |V| **=** disconnect/connect the SC25 speaker relay.

|B| |N| = disconnect/connect the SCC25(single link staff phone) relay

|A |‖ S = decrement / increment the link

|K |‖ L = decrement / increment the physical number. The specified physical number is held static on the LLM & SC25 connectors so that it can be measured with a meter for verification.

|, |‖. | = Whatever connections you have made on the SC25, SCC25, & LLM for the given physical number, are broken, the next physical number is selected, and the equivalent connections are made for it. One display line is output for each physical number. Thus the screen keeps a running log of the last 10 or 20 lines tested. Remember that only the bottom line is constantly updated & responsive to changes in the LLM or SC25 remotes (phones & call switches)

This diagnostic attempts to give a static picture of the TC4 hardware as seen by the CPU and TC4 control program. As such, it is a good tool for identifying hardware defects without involving details of user programming and setup. The i/o diagnostic is most useful when used with the PC near the TC4, but can also be of considerable value in use with a modem. The analog voltages used by the MI0 (LLM 'MPX' & SC25 'A & B') can be measured with a high impedance digital meter if necessary; or the equivalent information **can** be derived from the bottom display line.

```
   P:100  LNK: 1  LLM:N  SC:N  P3:11111111

   P:IOI  LNK: 1  LLM:+  SC:G  P3:11110111  V

   P:102  LNK: 1  LLM:-    SC:R   P3:11111111
```

The above display shows that the program is currently monitoring physical line no. 102. The MI0 is addressing link 1 (in case any connections are requested). The '-' next to the 'LLM:' shows that there is an LLM & line hybrid, and the phone is on hook. **If you** were to

pick up that phone, you would see the '-' change to a '+' as was found for line P:lOl. If there were no LLM or no line hybrid for the line, you would see an 'N' as shown for line 'P:lOO'.

'SC:R' means that there is a resistor ground on the 'T' terminal of the SC25 for line P:102. The other two lines show the cases of a grounded call in line and no signal ('N').

If you close the speaker relay of the current line, the VCM2 gets connected to the 'D & E' terminals. If there is a speaker or equivalent resistive load across the terminals, the VCM is   activated and, it provides a logic low on bit 3 of the misc input port. When this occurs, a 'V' is produced at the end of the line as was shown for '101' above. All pins of the "misc input port 3" are accessible on the MI0 edge connectors. This could be used for sensing of other customized status signals.

5. LOGGING-

Choosing option 5 logging will log messages received from the serial port of the CPU with a time stamp. The time and date will be printed at the top of the fde. Messages will be logged in the form: elapsed time in hundredths of seconds, starting time of the message, the actual message sent. A typical entry would look as follows:

e 38 10:28:15.16 MESSAGE

where:

    The message from the CPU is "MESSAGE
    The first character was received at 10:28:15.16
    The elapsed time of the message was .38 seconds

Located at the bottom of the screen in reverse video will be two lines. The first line displays the destination of the output (SCREEN,filename, PRINTER), the date, the time the logging began, and the current time. The second line reminds you how to exit the logging function.

Chapter 5
OTHER OPTIONS

1. PRINTER TOGGLE (^ P)

When in terminal mode the program may be instructed to echo all data displayed on the screen to the printer by typing ^P. To turn off the echo to the printer type ^ P again. Subsequent presses of ^ P turn the printer echo on and off.

2.TYPE A FILE(^T)

When in terminal mode you may type a text file such as this one or one that you make with your own word processor to serve as a help or reminder file of commands, addresses, etc. File names such as 'AAA" or "BBB" are quick and easy to type, and convenient if limited to one screen full.

3. SEND A HEX PILE (^ X)

A hex file such as "TDGO4.HEX"   on this disk can be sent to the TC4 CPU and executed with the " ^ G" function or trap switch. The "TDG04.HEX tile contains a program that sends a short test message to the LCD's and the serial port whenever the "TRAP" p.b. on the CPU is pressed. Both, source & hex file are included on diagnostic disk.

note: the hex tile on the disc has values for ver 100.

Chapter 6
GENERAL NOTES

1. ENTERING DATA-

When two or more numbers are asked for, use a space to separate them or a "-" as prompted.

Sometimes, as when responding to a menu, the program responds immediately & no tab or return key is needed.

2. OPERATIONAL-

Turning off your PC will not break your modem connection to the phone lime. Turning off the modem at either end, will turn off the other one also.

You can make a printout of this file for reference purposes.

To disable MTGlOO tones from TZ store a zero instead of a tone select digit l-4. This is used for fire alarm systems.

3. SOFTWARE CHANGES-

Version 6 changes:
New visually oriented architectural data editor with help functions. 2400 baud communication supported. Stand Alone mode - allow operation without a CPU connection. Ability to display a directory when prompted for file names.

Version 4 changes:
Added new active list procedure:
- Non interfering with traffic
- Include relevant attributes in display
  Allow scrolling up & down
- Keep data for review, or save to text file
- Recognize & respond to different data structure for active list in Ver 100.
Added auto dialing options:
Using ^ G instead of G for monitor Go function. Go function could sometimes be triggered by modem "RING" message which contains the letter G. "G" is still required by version 12 and earlier TC4 systems. Version 14 is first to use ^ G. T4 uses "G" for older TC4 versions, and " ^ G" for the newer ones.

Version 2 changes:
- When sending a tile with monitor lock on, version 1 would lock the monitor at block 20 & prevent the sending of any more blocks. The present version always sends unlocked status & then locks when done.
- When asked to select comm mode 1,2,3,4 at start, any other key is now ignored rather than crashing system.
-In ^A mode
 is allowed where only ab would work properly in version 1.
- Listing Arch data now allows data to file instead of screen or printer.